several layers of adhesive plaster. When working efficiently the rate of flow into bottle B will be from thirty to fifty drops per minute.

There is no age limit to the applicability of the method, though babies and children require more surveillance. Where this method of treatment has been instituted at the proper period the average length of time necessary for its employment has been two weeks. After removing the tubes the incision soon heals and x-rays show little, if any, lung collapse.

With this method, by which a considerable amount of negative pressure is continuously exerted on the lung, there is a greater likelihood of the lung expanding where there has been thickening of the visceral pleura than when simple air-tight drainage is used.

I also feel there is a distinct advantage over the introduction of intercostal drains, as the possibility of compression of the tube and lessening of its caliber between the ribs is not a factor when a portion of the rib has been resected. The amount of additional shock when local anesthesia is used is almost negligible.

While the apparatus may appear a bit cumbersome, in reality it is simple to assemble, easily procurable, works efficiently, and is comfortable for the patient.

401 South Beretania Street.

TUMORS OF THE CAROTID BODY*

REPORT OF CASE

By W. H. BUDGE, M. D.
Ogden, Utah

THE carotid body is not a new discovery. Its existence has been known since 1743, when when Von Holler found it and described its relations and macroscopic appearance. In 1862, one hundred and nineteen years later, Luschka noted its constant occurrence and made the first microscopic examination. It appears that Riegner, in 1880, was the first to remove a tumor of this gland. He called attention to the malignant tendency of such growths. Since 1891 up to the present time about one hundred cases have been reported by different surgeons, but not more than three have been reported by any one surgeon. In spite of the number of cases reported the clinical symptomatology, the etiology, and histologic characteristics are still more or less obscure.

THE CAROTID BODY

Nomenclature.—The exact nature of the gland or organ under discussion has been so uncertain that several different names have been given it, such as: intercarotid ganglion, Luschka's gland, intercarotid arterial glomerulus, carotid ganglion, and carotid body.

Anatomy.—When Von Holler stated over one hundred and eighty years ago that he found a nodule about the size of a kernel of wheat at the bifurcation of the common carotid artery, that it was set in the sympathetic nerve plexus around the artery and almost fused with its wall, and called it the intercarotid ganglion because he regarded it as a nerve structure. He little knew that at the present time his views, with a few modifications, would be confirmed.

Luschka's microscopic findings also have been substantiated of large cells in clusters surrounded by thin capillaries and sympathetic nerve fibers, which suggested to him their analogy to the adrenal bodies, the anterior lobe of the pituitary and other ductless glands. There has been, however, some disagreement among modern histologists in regard to the character of the cells and blood vessels, and the question of their close relationship with the nerve fibers.

The blood is supplied by three or four small arteries that enter at its lower pole. A corresponding number of veins leave at its upper pole. Its nerves are numerous and come from several sources among which are: the vagus, sympathetic, hypoglossal, and the glossopharyngeal.

Histology.—Dr. James Dawson reports the sections show irregularly arranged clumps and rows of cells occupying the interspaces within a close capillary network. The cells are fairly granular and when treated with chromic acid take the yellow color of "chromaffin" cells. The specific cells and endothelium probably share in the tumor process.

Physiology.—The function of the carotid body is not known. Experimentally its juice has been known to kill a rabbit in a few minutes, and small doses will depress the vascular system, which is just the opposite from the action of adrenalin. Bilateral removal of the organ has produced glycosuria and fatal cachexia. Undoubtedly the carotid belongs to the sympathetic ganglia.

Symptoms.—The symptoms are pressure symptoms such as: bruit and thrill, tinnitus aurium, harshness, cough and vocal cord paralysis from involvement of the sympathetics, dysphagia, and dysphonia.

Diagnosis.—The growth is almost always unilateral and occurs with equal frequency on the two sides of the neck and in male and female subjects. The following points are important in diagnosis: position at carotid bifurcation, smooth oval outline, mobility from side to side but not up and down, transmitted pulsations from carotid, slow growth (often many years), absence of any pain or tenderness with bulging of the pharyngeal wall.

The differential diagnosis should include consideration of the possibility of enlarged lymph glands, *i. e.,* cervical adenitis, gland metastasis as in carcinoma, Hodgkin's disease, bronchial cyst, syphilitic enlargement of glands, gummata, tuberculous glands, dermoids, and aneurysm.

Pathology.—Tumors of the carotid may be benign or malignant. The benign tumors are simple hyperplasia, adenoma, and angioma. The malig-

* Read before the Weber County Medical Society, September, 1926.

nant tumors have been variously diagnosed as perithelioma, endothelioma, epithelioma, epithelial angiosarcoma, and carcinoma. These tumors vary in size from an almond to a goose egg, are usually oval in shape, smooth, and occasionally lobulated. They are usually dark red in color on section, but may be almost white or yellow.

Operative Difficulties.—The growth commonly involves both internal and external carotid arteries and frequently the vagus and cervical sympathetic nerves are so intimately bound up in the tumor that they necessarily have to be sacrificed in its removal. In the fifty cases collected by Schmidt, forty-five patients had operations with twenty-eight cures, fourteen deaths, and three recurrences. Both vagus and sympathetic nerves were cut three times, and the vagus alone three times. In most of the patients both carotids were tied, in three patients only the external carotid was tied. Of the fourteen deaths two patients had bronchial pneumonia following section of the vagus, two died of hemorrhage, four had hemiplegia (evidently from tying the internal carotids), one died of sepsis, and five of various other causes.

Results.—The results in the cases operated on up to date have not been very creditable to the surgeon. The mortality is high. Laryngeal and other disturbances of a permanent nature should make one hesitate before operating. Among the serious complications that have resulted are hemiplegia, aphasia, paralysis of the facial and the hypoglossal nerves. If these tumors are to be treated successfully they should be operated on early before they have become so intimately attached to the carotids that ligation of the carotids is necessary for their removal. The surgeon will rarely see them in this state and will still more rarely make a correct diagnosis.

REPORT OF CASE

This patient, E. F. M., age thirty-eight, came to me June 9, 1926, giving a history dating back ten to twelve years. At that time he first noticed a small tumor mass in the left side of his neck. This was accompanied by the following symptoms, which were gradually becoming more pronounced: burning sensation on the left side of the neck, anterior to the ear and involving the side of the jaw, black spots before the eyes, vertigo, slight stiffness of the neck, occasional ringing of the ears, sensation of throbbing especially when he had a cold, and a dull aching. Sharp shooting pains were present during the last month before coming under observation.

The patient was a well-nourished man, weight 190 pounds. Family history negative. Past history and physical examination negative, aside from the tumor mass in the neck. On the left side of the neck, behind and below the angle of the jaw, lying deep in the carotid triangle, was a smooth, hard, nontender and nonfluctuating mass about the size of a hen's egg, movable laterally but not perpendicularly, extending from about the bifurcation of the common carotid artery, well up toward the base of the skull, behind the sternomastoid muscle.

A removal operation was done June 19, 1926. A slightly curved incision was made in the crease of the neck, on the left side overlying the tumor. Superficial tissues were cut through. Much bleeding was encountered, due to established collateral circulation. The sternomastoid muscle was retracted laterally. The tumor which was in a sheath was then exposed, lying underneath and partly medial to the sternomastoid. It was found to be very hard, adherent, deep red in color, the shape and size of a hen's egg and extending well up toward the base of the skull. The distal end was in the bifurcation of the common carotid artery and the external carotid was seen running over the lateral surface of the tumor. The finger was introduced under the proximal end of the tumor. This was difficult, due to the close proximity of the tumor and the base of the skull. The tumor was raised slightly and gently while the external carotid was dissected off the external surface with the finger of the other hand. The internal carotid was dissected off likewise and the tumor was completely removed. Considerable hemorrhage occurred from the posterior facial vein, which is a branch of the external jugular, and which was torn off just as the tumor was removed. This was controlled by hot packs and later ligature. After removal the internal and external carotids could be identified and were found to be pulsating normally. No nerves were cut, except superficial branches, all vessels were tied and a narrow iodoform gauze pack was put in. Fine catgut was used for superficial tissues, and silk for the skin. The pack was removed the following day.

Pathologic Report.—Made by Dr. E. C. Barrett, pathologist to the Thomas D. Dee Memorial Hospital: Small hen's egg sized tumor mass which histologically shows that both the specific cells and the endothelium participated in the process, yielding a more or less homogeneous mass involving the entire gland.

The stroma was infiltrated with tumor cells, which are distinctly polyhedral and granular. They are arranged for the most part in compact groups without lumen, supported by abundant capillaries.

There are larger cell groups with a tendency to degeneration and hemorrhage into the central cavity. Occasional knobs of hyaline-like material are seen in the stroma, often bulging into capillaries.

Diagnosis.—Endothelioma of carotid.

Subsequent Course.—The next morning, following the operation, I visited the patient and talked with him. The same afternoon the nurses noticed that he could talk only by whispering. This whispering continued until November 14, 1926, when upon arising he suddenly spoke aloud. He was very surprised and came to my office and talked to me. The following day his voice left; and he continued to whisper until September 7, 1928, when suddenly, while directing some construction work, his voice returned. He reported to me again on October 1, 1928, and his voice was perfectly clear. He speaks with as much ease, in both high and low tones, as any normal individual. At the present time, thirty-two months after operation, the patient is perfectly well and there are no signs of recurrence. This speech impairment undoubtedly was mental.

SUMMARY

1. A new case of carotid gland tumor is reported.

2. The extreme rarity of a tumor of the carotid body is noted.

3. Physical findings in case reported, which were definite, fit in perfectly with those found previously and described by other surgeons having similar cases, but which were unknown to me.

4. Diagnosis was not made before operation.

5. Results: Temporary loss of voice; otherwise patient is well.

309 First National Bank Building.